GREENACRES LANDFILL

PERIODIC REVIEW

SPOKANE, WA

EASTERN REGIONAL OFFICE

TOXICS CLEANUP PROGRAM

OCTOBER 2007

1.0 INTRODUCTION

This report documents the Washington Department of Ecology's (Ecology) periodic review of post-cleanup conditions at the Greenacres Landfill Superfund Site (Site). The purpose of the review is to assure that the completed remedial actions at the Site continue to protect human health and the environment. The Cleanup Action Plan (CAP) was written in accordance with the Model Toxics Control Act (MTCA) Chapter 70.105D RCW. The CAP was implemented by Spokane County, the potentially liable person (PLP), under Consent Decree 97207896-7. The Consent Decree was filed in Spokane County Superior Court on December 30, 1997.

The State of Washington has determined that the final remedy has been constructed in general accordance with the Greenacres Landfill Cleanup Action Plan, dated December 21, 1992, and the Greenacres Landfill Closure Final Design dated April 24, 1998. MTCA citations are from the 1991 version unless otherwise noted.

The cleanup action used a cover system coupled with a gas extraction system for the closed landfill. The landfill and associated groundwater plume exceeded cleanup levels established for the Site. WAC 173-340-420 (1) requires that " if the department selects or approves a cleanup action that results in hazardous substances remaining at a site at concentrations which exceed cleanup levels established under WAC 173-340-700 through 173-340-760 or if conditional points of compliance have been established, the department shall review the cleanup action no less frequently than every five years after the initiation of such cleanup action to ensure that human health and the environment are being protected."

When evaluating whether human health and the environment are being protected, the factors the department shall consider include WAC 173-340-420(4):

(a) The effectiveness of ongoing or completed cleanup actions;
(b) New scientific information for individual hazardous substances or mixtures present at the site;
(c) New applicable state and federal laws for hazardous substances present at the Site;
(d) Current and projected site use;
(e) Availability and practicability of higher preference technologies; and
(f) The availability of improved analytical techniques to evaluate compliance with cleanup levels.

Notice of this periodic review and 30-day comment period will be placed in Ecology's site register.

2.0 SUMMARY OF SITE CONDITIONS

The following sections provide a brief Site history and a remedial action summary completed at the Site. In addition, the cleanup levels and the points of compliance for the Site are also discussed.

2.1 Site Description and History

The Greenacres Landfill Site (the Site) is located about 14 miles east of the City of Spokane. The Site is located mostly within the southwest quarter of the southwest quarter of Section 16, Township 25 North, Range 45 East, Willamette Meridian (WM) in Spokane County, Washington (Figure 1). The Site covers approximately 58 acres and is situated in a former ravine that merges with the Spokane Valley to the north. Underlying the Spokane Valley is the Spokane-Rathdrum Prairie Aquifer which was designated as a "Sole Source Aquifer" in 1978 and provides the drinking water for approximately 500,000 people.

The Site was reportedly used for dumping through the late 1940s. In 1951, the Site was deeded to Greenacres Township for use as a municipal dump. The Township owned the Site and contracted for site operators from 1951 through March 1967. In March 1967, the Township form of government was dissolved in Spokane County, and Spokane County began operating the Site. Spokane County continued to operate the Site until 1972 when the Site was filled to capacity and closed. In 1971, Spokane County deeded a portion of the Site to Holiday Hills Recreation Center, Inc. Spokane County sold the remaining portion of the landfill Site to Holiday Hills Recreation Center, Inc. in 1972.

During a groundwater quality monitoring survey in 1978, a nearby residential well, located approximately 600 feet downgradient from the Site and owned by Mrs. Ruth Jeffers was found to be contaminated. Additional testing completed in 1980 indicated the presence of volatile organic compounds in Mrs. Jeffers' well. The Spokane County Health District subsequently advised Mrs. Jeffers to procure an alternative water supply.

In 1983, the U.S. Environmental Protection Agency (EPA) nominated Greenacres Landfill for the National Priorities List (NPL) and EPA placed the Site on the NPL in 1984. In 1985, EPA conducted a preliminary investigation of the Site at which time three groundwater monitoring wells were installed. Monitoring data collected by EPA and Ecology indicated the Site was the source of contamination observed in Mrs. Jeffers' well and the two downgradient monitoring wells. The data further indicated that hazardous substances or contaminants were being released into groundwater of the state. These contaminants include volatile and semi-volatile organic compounds and metals. EPA notified Spokane County and Holiday Hills Recreation Center, Inc. of its potential liability under the Comprehensive, Environmental, Response, Compensation, and Liability Act (CERCLA) in 1985.

EPA and Ecology agreed in 1985 that Ecology would assume lead agency status of the Site. A Memorandum of Agreement, executed in 1989 between the EPA and Ecology, gave Ecology responsibility for all aspects of the remedial investigation, feasibility study,

remedial design, remedial action and community relations activities at state lead Superfund sites. The agreement specified that all activities at state lead NPL sites such as the Greenacres Landfill would be completed under state authorities.

In 1985, Ecology initiated remedial investigation activities at the Site, undertaking and completing a community relations plan, a seismic refraction survey, a hydrologic budget, and a detailed remedial investigation work plan. Ecology subsequently notified Spokane County and Holiday Hills Development, Inc. in 1987 of its potential liability under state and federal law and requested that each party assume responsibility for the necessary response actions at the Site. In 1993, Ecology notified Liberty Lake Investments, Inc., a successor in interest to Holiday Hills Recreation Center, Inc., of its potential liability under MTCA Chapter 70.105D RCW.

In 1988, Spokane County began conducting a Remedial Investigation/ Feasibility Study (RI/FS), under Consent Order 87-0926 at the Site. The purpose of the RI was the following: (1) determine the nature and extent of the release or threatened release of hazardous substances, pollutants and contaminants at the Site; and (2) characterize the Site to provide sufficient information to determine the necessity for and the proposed extent of remedial action. The purpose of the FS was to identify, develop, evaluate, and select remedial action alternatives which are consistent with a permanent remedy to prevent or minimize the release or threatened release of hazardous substances, pollutants and contaminants from the Site.

The RI/FS was completed in 1991. The results of the investigation substantiated earlier data that leachate from the landfill is contaminating underlying alluvial and bedrock aquifers with volatile and semi-volatile organic compounds and metals. In addition, low levels of volatile organic gases were detected onsite and offsite during sampling of landfill soil gas.

Following a public hearing and additional opportunity for public review and comment, Ecology completed the Final Cleanup Action Plan (FCAP) for the Site on December 21, 1992. The FCAP specified the following requirements, which included the presumptive remedy for landfills, for the Site cleanup action:

A. Conduct indoor air sampling at adjacent residences.
B. Construct a Minimum Functional Standards (MFS) cover under Chapter 173-304 (WAC) for the landfill.
    i) Control landfill gas
    ii) Control landfill access
    iii) Control stormwater run on/ run off
C. Provide institutional controls for the Site.
D. Monitor Site groundwater.

Ecology and Spokane County entered into formal Consent Decree negotiations on April 14, 1993. Consent Decree negotiations for the implementation of the Cleanup Action Plan failed to reach consensus and were terminated after one year. Ecology issued Enforcement Order No. DE 94TC-E101 to Spokane County and Liberty Lake

Investments, Inc. on April 18, 1994. The Enforcement Order required the Defendants to implement the FCAP.

Spokane County conducted groundwater monitoring in accordance with the Order from the period of May 1994 to January 1997. The groundwater monitoring program indicated that volatile organic compounds (VOCs), semi-volatile compounds, and metals were present above the cleanup levels for the Site in several monitoring wells.

Ecology, Liberty Lake Investments, Inc., now known as Liberty Lake Land Company, LLC, and Spokane County entered into formal Consent Decree negotiations on May 7, 1997. Ecology and Spokane County negotiated and signed the Consent Decree to implement the Cleanup Action Plan at the Greenacres Landfill in November 1997. The Consent Decree was made available for public comment and finalized in December 1997. Liberty Lake Land Company elected not to be a signatory to the Decree and continue to be bound by an Enforcement Order.

2.2 Cleanup Levels and Points of Compliance

The FCAP identified five volatile organic compounds (VOCs), two semi-volatile organic compounds (SVOCs), and five metals as indicator substances for Site groundwater. The metals have been separated into Group 1 and Group 2 metals. Group 1 metals are contaminants that have consistently been detected above cleanup levels in the alluvial wells. Group 2 metals have not been detected above cleanup levels prior to cover system placement. Each indicator substance and associated cleanup level reported as micrograms per liter (ug/L) or parts per billion (ppb) is presented below.

- **VOCs** - Tetrachloroethylene – 5 ppb, Trichloroethylene - 5 ppb, 1,2 Dichloroethane - 5 ppb, 1,2 Dichloroethene – 50 ppb, and Vinyl Chloride – 1 ppb

- **SVOCs** - Pentachlorophenol (PCP) – 1 ppb, Bis (2 ethylhexyl) phthalate (BEHP) – 4 ppb

- **Metals** - Group 1 - Arsenic – 5 ppb, manganese – 50 ppb, Group 2 antimony – 5 ppb, chromium – 80 ppb, lead – 50 ppb,

The groundwater point of compliance was established from the uppermost level of saturated zone to the lowest depth which could be potentially affected by the Site over the entire site. Groundwater cleanup levels will be met in all groundwater from the point of compliance to the outer boundary of the hazardous waste plume.

2.3 Remedial Construction Activities

The landfill closure was conducted according to Washington State regulations, the Model Toxics Control Act (MTCA) WAC 173-340 and Minimum Functional Standards for Solid Waste Handling WAC 173-304. Spokane County's consultant, Woodward-Clyde Consultants, completed the final design in April 1998. A technical equivalent cover

system was used to meet or exceed the performance standards set forth in WAC 173-304. The cover system consisted of a 12-inch foundation layer overlain by a 12-ounce non-woven geotextile covered by 30-mil polyvinyl chloride (PVC) geomembrane liner. Another 12-ounce non-woven geotextile overlays the liner and is covered with 18-inches of soil. The upper 6 inches of the soil are topsoil designed to support the vegetative cover. An active gas extraction system was installed to control landfill gas migration. A stormwater control system was established to mitigate stormwater run off and run on. Additional design details are provided in the Engineering Design Report (Woodward-Clyde Consultants, 1998).

Spokane County and their selected contractor began the remedial construction activities on July 7, 1998. The work was performed under Consent Decree as described above. During construction additional refuse was discovered beyond the previously determined boundaries. Refuse was relocated to meet physical Site constraints resulting in a final landfill configuration of approximately 58 acres. Remedial construction activities were monitored and inspected by Woodward-Clyde Consultants for Spokane County. Spokane County representatives, the remedial construction contractor, Woodward-Clyde Consultants, and Ecology completed a final inspection in late November 1998. A punch list was developed, and some of the items on the list were addressed immediately and some were postponed until May 1999.

The landfill gas system continues to operate, and gas is combusted on-site by a solar flare with combustion assistance from a fixed propane source. The landfill gas is comprised mostly of methane with limited amounts of volatile organic compounds. The initial methane concentrations of 20% by volume have decreased to about 8% by volume. The landfill gas combustion system is equipped with an automatic re-ignition in case the flare goes out. If the system cannot re-light, the system shuts down. The system has operated well with no down time except for maintenance.

MTCA requires that where soil cleanup levels are exceeded, a restrictive covenant must be placed with the deed. As required by the FCAP, a restrictive covenant was placed on the landfill and affected property and includes the following restrictions:

- No withdrawal of water;
- Maintenance of fences and locked gates;
- No Site access other than for operations and maintenance; and
- No actions that may facilitate a release or create an exposure pathway.

Institutional controls were placed on the Site by August 1999.

In accordance with the post-closure monitoring plan (Woodward-Clyde, 1999), groundwater monitoring of the indicator substances occurs quarterly for the five VOCs and Group 1 metals in alluvial monitoring wells WCC-2, WCC-4A, WCC-11B, WCC-12, and bedrock monitoring wells WCC-1, WCC-7, WCC-8, and WCC-9. The SVOCs are monitored quarterly in bedrock wells WCC-7 and WCC-8 for PCP and WCC-7 and WCC-1 for BEHP. The Group 2 metals and SVOCs are monitored annually. Upgradient bedrock monitoring well, WCC-10, is monitored annually for the indicator substances.

Figure 2 shows the locations of the wells. A graphical representation of monitoring well contaminant concentrations is included as Appendix A.

3.0 PERIODIC REVIEW

The purpose of periodic reviews is to ensure that human health and the environment remain protective when hazardous substances remain on site as part of the remedial action. The Final Cleanup Action Plan, which included a presumptive remedy, has been implemented at the Site. The receptors and exposure pathways identified in the FCAP have not changed. The completed remedy, which included institutional controls, has eliminated exposure pathways and remains protective.

Groundwater contamination remains above cleanup levels set for the Site in the FCAP. Post-closure monitoring began in February 1999 and will continue in accordance with the compliance monitoring plan.

Operation and maintenance activities continue at the Site. The final draft Post-Closure Inspection, Maintenance, Operations, and Compliance Monitoring Plan were submitted for Ecology's review in April 1999. After review and discussion, the plan was finalized in 2000. Spokane County personnel continue to conduct Operations and Maintenance (O&M) at the Greenacres Landfill, and O&M will continue to be required until the cleanup goals are reached. The cleanup action report was finalized in 2001.

3.1 Effectiveness of Cleanup Actions

The landfill cover system has removed the potential pathway for direct contact and ingestion of contaminated soil or refuse. In addition, the cover system has eliminated the potential for precipitation to come into contact with refuse resulting in diminished leachate production that may affect groundwater. The landfill gas extraction system continues to manage landfill gas and eliminates the outward migration of gases beyond the landfill perimeter.

Groundwater concentrations remain above cleanup levels in some wells immediately downgradient of the landfill. Specifically, monitoring wells WCC-12, WCC-4A, WCC-2, and WCC-11B remain above cleanup levels for VOCs and Group 1 metals. Appendix A presents graphical illustration of monitoring well contaminant concentrations. The overall trends indicate a general decline in alluvial contamination and wells historically above cleanup levels such as bedrock wells WCC-1, WCC-7, WCC-8, and WCC-9 are now below cleanup levels since cover system placement.

Institutional controls were placed on the landfill property and on Liberty Lake Land Company's property downgradient of the landfill. The controls are in-place and will remain until Ecology determines they are no longer warranted. Substantial commercial and residential development has been constructed in the vicinity of the Site since the

institutional controls have been placed. Ecology and Spokane County have worked closely with the developers to assure compliance with the controls.

3.2 New Scientific Information

There is no new scientific information that affects the Site.

3.3 New Applicable State and Federal Laws

The FCAP, written in 1992, was based on the 1991 edition of the Model Toxics Control Act (MTCA). MTCA has been amended three times since the FCAP was completed. Although the cleanup level for lead and manganese have changed as a result of these modifications, site cleanup levels determined in the FCAP will not change. WAC 173-340-702(12)(c)[2001 edition] provides that: "A release cleaned up under the cleanup levels determined in (a) or (b) of this subsection shall not be subject to further cleanup action due solely to subsequent amendments to the provision in this chapter on cleanup levels; unless the department determines, on a case-by-case basis, that the previous cleanup action is no longer sufficiently protective of human health and the environment." The department has determined the remedy is still protective since the cleanup action coupled with institutional controls prevents exposure to potential receptors.

The change in cleanup level for lead has decreased to the new federal maximum contaminant level (MCL) of 15 ppb. The manganese cleanup level using new MTCA health based criteria and not secondary MCL levels would raise the cleanup level to 2,240 ppb.

3.4 Current and Projected Site Use

The site is currently a closed landfill and will remain in post-closure care. Ecology does not anticipate a change in Site use. As stated in Section 3.1, substantial commercial and residential growth has occurred and is anticipated to continue in the vicinity of the Site.

3.5 Availability and Practicability of Higher Preference Technologies

The cleanup action implemented a presumptive remedy for the Site. The landfill cover system, gas extraction system, and stormwater management system are protective of human health and the environment. Groundwater remedies were not considered viable during the FS evaluation. Higher preference cleanup technologies such as source removal may be available for the Site, but are still not practicable at this Site.

3.6 Availability of Improved Analytical Techniques to Evaluate Compliance with Cleanup Levels.

The analytical methods used for the VOC analyses have changed from EPA Method 8240 to EPA Method 8260B. The new method uses a gas chromatograph mass spectrometer (GC/MS) with a capillary column versus the old method using a GC/MS with a packed

column. Vinyl Chloride and 1,2-DCA cleanup levels were based on the practical quantification limit (PQL) in the FCAP. Since that time a lower PQL is available with the new method that is being utilized for monitoring. As stated in Section 3.3, the Site cleanup level for vinyl chloride and 1,2-DCA will not change.

4.0 CONCLUSIONS

The selected remedial action for the Greenacres Landfill continues to be protective of human health and the environment. The cover and associated systems have eliminated the direct contact pathway for refuse and soil contamination. The gas management system eliminates fugitive gas migration beyond the landfill perimeter and potential vapor transport of contaminants to groundwater. The stormwater management system transports water off the cover and conveys the stormwater to an evaporation pond. The stormwater system intercepts run-on from the surrounding hillsides and conveys the stormwater to an evaporation pond.

Prior to the remedial action, the alluvial aquifer and underlying bedrock aquifer were contaminated with the Site indicator substances. Following remedy implementation, groundwater in the bedrock aquifer is below cleanup levels. While contaminant concentrations continue to be above cleanup levels in the alluvial aquifer, concentrations have declined. Since groundwater cleanup levels have not been met at the point of compliance, the institutional controls will remain in effect. The restrictive covenant placed on the landfill and property overlying the groundwater plume has been recorded and will continue to be effective in protecting human health and the environment and assuring the integrity of the cleanup action.

Compliance monitoring has been performed in accordance with the schedule set forth in the Consent Decree. The compliance monitoring will continue until Ecology determines it is no longer necessary.

Based on this periodic review, Ecology has determined that the remedial action has reduced the contamination at the Site and is considered protective of human health and the environment. According to WAC 173-340-740(6)(d), the cleanup action is determined to comply with cleanup standards since the long-term integrity of the containment system is ensured and the requirements for containment technologies in WAC 173-340-360(8) have been met. Spokane County will continue to be responsible for operations and maintenance of the Site.